CLAIMS

What is claimed is:

1. An optical device comprising:

a first light source that emits first light onto a surface; and

a first detector that receives light reflected from said surface, wherein reflected light produces a first speckle pattern at said first detector with said optical device and said surface separated by a first distance, wherein a quantifiable attribute associated with said first speckle pattern is used to measure distance between said optical device and said surface.

2. The optical device of Claim 1 wherein reflected light produces a second speckle pattern at said first detector with said optical device and said surface separated by a second distance, wherein said quantifiable attribute associated with said first speckle pattern and a quantifiable attribute associated with said second speckle pattern are used to measure distance between said optical device and said surface.

3. The optical device of Claim 2 wherein the ratio of said quantifiable attribute associated with said first speckle pattern and said quantifiable attribute associated with said second speckle pattern is used to measure distance between said optical device and said surface.

4. The optical device of Claim 2 wherein said first light is adjusted from a first wavelength at said first distance to a second wavelength at said second distance so that said quantifiable attribute associated with said first speckle pattern and said quantifiable attribute associated with said second speckle pattern are approximately equal, wherein the ratio of said first and second wavelengths is used to measure distance between said optical device and said surface.

5. The optical device of Claim 2 further comprising a second light source adapted to emit second light onto said surface, said first light comprising light at a first wavelength and said second light comprising light at a second wavelength that is different from said first wavelength, wherein said first speckle pattern is produced by reflected first light and said second speckle pattern is produced by reflected second light.

6. The optical device of Claim 5 wherein said first and second wavelengths are selected so that said quantifiable attribute associated with said first speckle pattern and said quantifiable attribute associated with said second speckle pattern are approximately equal, and wherein the ratio of said wavelengths is used to measure distance between said optical device and said surface.

7. The optical device of Claim 1 further comprising:

a second light source adapted to emit second light onto said surface, said first light comprising light at a first wavelength and said second light comprising light at a second wavelength that is different from said first wavelength; and

a second detector adapted to receive light reflected from said surface, wherein said first speckle pattern is produced at said first distance by reflected first light received by said first detector and wherein a second speckle pattern is produced at said first distance by reflected second light received by said second detector, wherein the difference between said quantifiable attribute associated with said first speckle pattern and quantifiable attribute associated with said second speckle pattern is used to determine said first distance.

8. The optical device of Claim 1 wherein said quantifiable attribute associated with said first speckle pattern corresponds to the average speckle size of said first speckle pattern.

9. The optical device of Claim 1 wherein said quantifiable attribute associated with said first speckle pattern corresponds to the number of speckles in said first speckle pattern.

10. The optical device of Claim 1 wherein said quantifiable attribute associated with said first speckle pattern corresponds to the amount of brightness measured by said first detector.

11. The optical device of Claim 1 further adapted to detect transverse movement of said optical device relative to said surface.

12. A method of optical navigation using an optical device, said method comprising:

detecting at said optical device a first speckle pattern produced by light comprising light at a first wavelength reflecting from a surface with said optical device at a first distance from said surface;

detecting at said optical device a second speckle pattern produced by light comprising light at a second wavelength reflecting from said surface with said optical device at a second distance from said surface, wherein said first and second wavelengths are selected so that a first quantifiable value associated with said first speckle pattern and a second quantifiable value associated with said second speckle pattern are approximately equal; and

measuring distance between said optical device and said surface using the ratio of said first and second wavelengths.

13. The method of Claim 12 wherein said light at said first wavelength and said light at said second wavelength are provided from a single light source, wherein the wavelength of light provided from said single light source is adjusted from said first wavelength to said second wavelength during movement of said optical device from said first distance to said second distance.

14. The method of Claim 12 wherein said light at said first wavelength is provided by a first light source and said light at said second wavelength is provided by a second light source.

15. The method of Claim 12 wherein said first and second quantifiable values correspond to the average speckle size of said first and second speckle patterns, respectively.

16. The method of Claim 12 wherein said first and second quantifiable values correspond to the number of speckles in said first and second speckle patterns, respectively.

17. The method of Claim 12 wherein said first and second quantifiable values correspond to the amount of brightness associated with said first and second speckle patterns, respectively.

18. In an optical device, a method of optical navigation, said method comprising:

detecting at said optical device a first speckle pattern produced by light comprising light at a first wavelength reflecting from a surface;

detecting at said optical device a second speckle pattern produced by light comprising light at a second wavelength reflecting from said surface; and

measuring distance between said optical device and said surface using a first quantifiable value associated with said first speckle pattern and a second quantifiable value associated with said second speckle pattern.

19. The method of Claim 18 wherein said first and second wavelengths are substantially the same, wherein said distance is measured using the ratio of said first quantifiable value and said second quantifiable value.

20. The method of Claim 18 wherein said first and second wavelengths are different from each other, wherein said distance is measured using the difference between said first quantifiable value and said second quantifiable value and the difference between said first and second wavelengths.

21. The method of Claim 18 wherein said light at said first wavelength and said light at said second wavelength are emitted from a single light source.

22. The method of Claim 18 wherein said light at said first wavelength is provided by a first light source and said light at said second wavelength is provided by a second light source.

23. The method of Claim 18 wherein said optical device comprises a single detector for detecting said first and second speckle patterns.

24. The method of Claim 18 wherein said optical device comprises a first detector for detecting said first speckle pattern and a second detector for detecting said second speckle pattern.

25. The method of Claim 18 wherein said first and second quantifiable values correspond to the average speckle size of said first and second speckle patterns, respectively.

26. The method of Claim 18 wherein said first and second quantifiable values correspond to the number of speckles in said first and second speckle patterns, respectively.

27. The method of Claim 18 wherein said first and second quantifiable values correspond to the amount of brightness associated with said first and second speckle patterns, respectively.